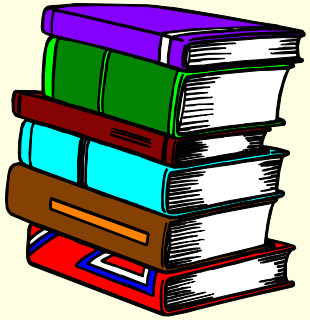
IEEE 12207 “Software Life Cycle Processes”



Introduction for the Implementation of Software Configuration Management

IEEE 12207 "Software Life Cycle Processes"

History of 12207

ISO/IEC 12207 – 1995: Standard for Information Technology – Software Life Cycle Processes

IEEE/EIA 12207.0 – 1996: Software Life Cycle Processes

IEEE/EIA 12207.1 – 1998: Software Life Cycle Processes –

Life Cycle Data

IEEE/EIA 12207.2 – 1998: Software Life Cycle Processes –

Implementation

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Abstract

ISO/IEC 12207 provides a common *framework for developing and managing software*. IEEE/EIA 12207.0 consists of the clarifications, additions, and changes accepted by the Institute of Electrical and Electronics Engineers (IEEE) and the Electronic Industries Alliance (EIA) as formulated by a joint project of the two organizations. IEEE/EIA 12207.0 contain concepts and guidelines to foster better understanding and application of the standard. Thus this standard provides industry a basis for software practices that would be useable for both national and international business.

IEEE 12207 "Software Life Cycle Processes"

- **Purpose:** This International Standard establishes a common framework for software life cycle processes, with well-defined terminology, that can be referenced by the software industry. It contains processes, activities, and tasks that are to be applied during the acquisition of a system that contains software, a stand-alone software product, and software service and during the supply, development, operation, and maintenance of software products. Software includes the software portion of firmware.

This International Standard also provides a process that can be employed for defining, controlling, and improving software life cycle processes.

- Application: Applies to the acquisition of systems and software products and services, to the supply, development, operation, and maintenance of software products, and to the software portion of firmware, whether performed internally or externally to an organization.

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4. Application of this International Standard (Clause 4) (pg 6)

This clause presents the software life cycle that can be employed to acquire, supply, develop, operate, and maintain software products. The objective is to provide a road map for the users of this International Standard so that they can orient themselves in it and apply it judiciously.

4.1.1 Life Cycle Processes: This International Standard groups the activities that may be performed during the life cycle of software into five primary processes, eight supporting processes, and four organizational processes. Each life cycle process is divided into a set of activities; each activity is further divided into a set of tasks. Subclause numbering a.b denotes a *process*, a.b.c an *activity*, and a.b.c.d a *task*. These life cycle processes are introduced below in depicted in figure 1 (see pg 7)

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5 PRIMARY LIFE CYCLE PROCESSES

- 5.1 Acquisition
- 5.2 Supply
- 5.3 Development
- 5.4 Operation
- 5.5 Maint.

8 SUPPORTING LIFE CYCLE PROCESSES

- 6.1 Documentation
- 6.2 Configuration Management
- 6.3 Quality Assurance
- 6.4 Verification
- 6.5 Validation
- 6.6 Joint Review
- 6.7 Audit
- 6.8 Problem Resolution

4 ORGANIZATIONAL LIFE CYCLE PROCESSES

- 7.1 Management
- 7.2. Infrastructure
- 7.3 Improvement
- 7.4. Training

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5 Primary Life Cycle Processes (Clause 5) (pg 9):

This clause defines the following primary life cycle processes:

5.1 Acquisition process;
5.2 Supply process;
5.3 Development process;
5.4 Operation process;
5.5 Maintenance process.

The activities and tasks in a primary process are the responsibility of the organization initiating and performing that process. This organization ensures that the process is in existence and functional.

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4.1.1.1 Primary Processes [task] (pg 6):

1) **Acquisition Process (subclause 5.1) [process]:** Defines the activities of the acquirer, the organization that acquires a system, software product or software service.

2) **Supply Process (subclause 5.2):** Defines the activities of the supplier, the organization that provides the system, software product or software service to the acquirer.

3) **Development Process (subclause 5.3):** Defines the activities of the developer, the organization that defines and develops the software product.

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4) **Operation Process (subclause 5.4):** Defines the activities of the operator, the organization that provides the service of operating a computer system in its live environment for its users.

5) **Maintenance Process (subclause 5.5):** Defines the activities of the maintainer, the organization that provides the service of maintaining the software product; that is, managing modifications to the software product to keep it current and in operational fitness. This process includes the migration and retirement of the software product.

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4.1.1.1 Primary Processes [task] (pg 6):

3) **Development Process:** Defines the activities of the developer, the organization that defines and develops the software product.

- Process Implementation
- System Requirements Analysis
- System Architectural Design
- Software Requirements Analysis
- Software Architectural Design
- Software Detailed Design
- Software Coding and Testing
- Software Integration
- Software Qualification Testing
- System Integration
- System Qualification Testing
- Software Installation
- Software Acceptance Support

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5.3.11 System Qualification Testing. **This activity consists of the following tasks, which the developer shall perform or support as required by the contract.**

5.3.11.1. System qualification testing shall be conducted in accordance with the qualification requirements specified for the system. It shall be ensured that the implementation of each system requirement is tested for compliance and that the system is ready for delivery. The qualification testing results shall be documented.

5.3.11.2. The system shall be evaluated considering the criteria listed below. The results of the evaluations shall be documented.

a) Test coverage of system requirements.
b) Conformance to expected results.
c) Feasibility of operation and maintenance.

5.3.11.3. The developer shall support audit(s) in accordance with 6.7. The results of the audit(s) shall be documented.

5.3.11.4. Upon successful completion of the audit(s), if conducted, the developer shall:

a) Update and prepare the deliverable software product for Software Installation and Software Acceptance Support.
b) Establish a baseline for the design and code of each software

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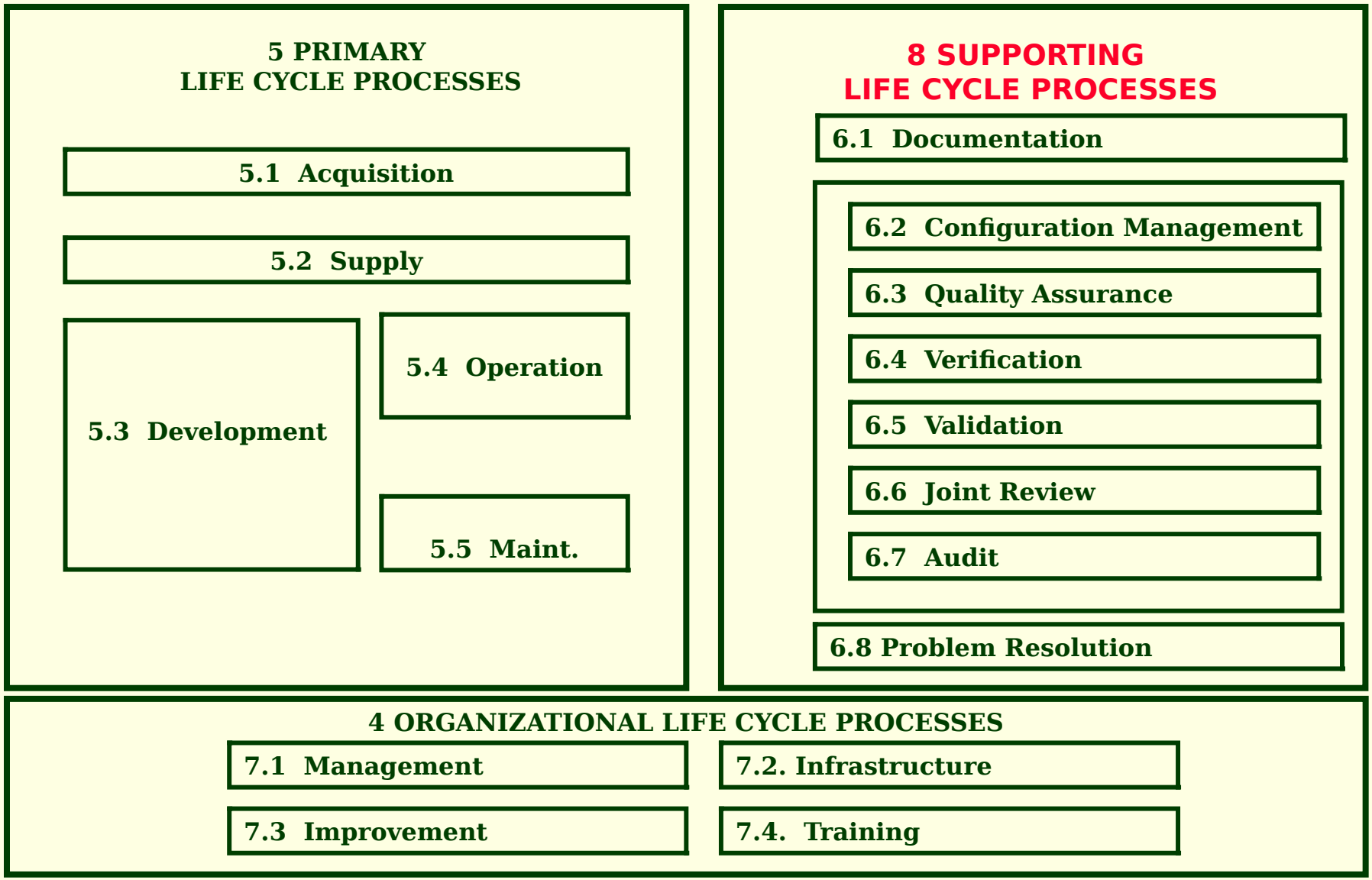

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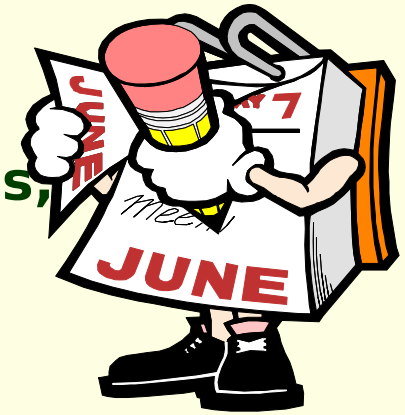
8 Supporting Life Cycle Processes (Clause 6) (pg. 27):

This clause defines the following supporting life cycle processes:



6.1 [a process] Documentation Process;
6.2 Configuration Management Process;
6.3 Quality Assurance Process;
6.4 Verification Process;
6.5 Validation Process;
6.6 Joint Review Process;
6.7 Audit Process;
6.8 Problem Resolution Process;

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4.1.1.2 Supporting Life Cycle Processes (pg 6):

1) **Documentation Process (subclause 6.1) [a process].** Defines the activities for recording the information produced by a life cycle process.

2) **Configuration Management Process (subclause 6.2).** Defines the configuration management activities.

3) **Quality Assurance Process (subclause 6.3).** Defines the activities for objectively assuring that the software products and processes are in conformance with their specified requirements and adhere to their established plans. Joint Reviews, Audits, Verification, and Validation may be used as techniques of Quality Assurance.

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3) **Verification Process (subclause 6.4).** Defines the activities (for the acquirer, the supplier, or an independent party) for verifying the software products and services in varying dept depending on the software project.

4) **Validation Process (subclause 6.5).** Defines the activities (for the acquirer, the supplier, or an independent party) for validating the software products of the software project.

5) **Joint Review Process (subclause 6.6).** Defines the activities for evaluating the status and products of an activity. This process may be employed by any two parties, where one party (reviewing party) reviews another party (reviewed party) in a joint forum.

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6) **Audit Process (subclause 6.7).** Defines that activities for determining compliance with the requirements, plans, and contract. This process may be employed by any two parties, where one party (auditing party) audits the software products or activities of another party (audited party).

7) **Problem Resolution Process (subclause 6.8).** Defines a process for analyzing and removing the problems (including nonconformances), whatever their nature or source, that are discovered during the execution of development, operation, maintenance, or other processes.

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6.2 Configuration Management Process [a process] (pg. 29):

The Configuration Management Process is a process of applying administrative and technical procedures throughout the software life cycle to: Identify and define software items in a system; control modifications and releases of the items; record and report the status of the items and modification requests; ensure the completeness, consistency, and correctness of the items; and control storage, handling, and delivery of the items.

List of Activities:

6.2.1 Process Implementation [activity]. This activity consists of the following tasks:

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6.2.1.1 A configuration management plan shall be developed [task]. The plan shall describe:

- **The CM Activities;**
- **Procedures and Schedule for performing these activities;**
- **The organization(s) responsible for performing these activities;**
- **and their relationship with other organizations, such as software development or maintenance. The plan shall be documented and implemented.**

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6.2.2 Configuration Identification [activity]. This activity consists of the following tasks:

6.2.2.1 [task] A scheme shall be established for the identification of software items and their versions to be controlled for the project. For each software CI and its versions, the following shall be identified: the documentation that establishes the baseline; the version references; and other identification details.

6.2.3 Configuration Control. This activity consists of the following task:

6.2.3.1 The following shall be performed: identification and recording of change requests; analysis and evaluation of the changes; approval or disapproval of the request; and implementation, verification, and release of the modified software item. An audit trail shall exist, whereby each modification, the reason for the modification, and authorization of the modification can be traced. Control and audit of all accesses to the controlled software items that handle safety or security critical functions shall be performed.

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6.2.4 Configuration Status Accounting. This activity consists of the following tasks:

6.2.4.1 Management records and status reports that show the status and history of controlled software items including baseline shall be prepared. Status reports shall include the number of changes for a project, latest software item versions, release identifiers, the number of releases, and comparisons of releases.

6.2.5 Configuration Evaluation. This activity consists of the following tasks:

6.2.5.1 The following shall be determined and ensured: the functional completeness of the software items against their requirements and the physical completeness of the software items (whether their design and code reflect an up-to-date technical description).

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6.2.6 Release Management and Delivery.

This activity consists of the following task:

6.2.6.1 The release and delivery of software products and documentation shall be formally controlled. Master copies of code and documentation shall be maintained for the life of the software product. The code and documentation that contain safety or security critical functions shall be handled, stored, packaged, and delivered in accordance with the policies of the organizations involved.

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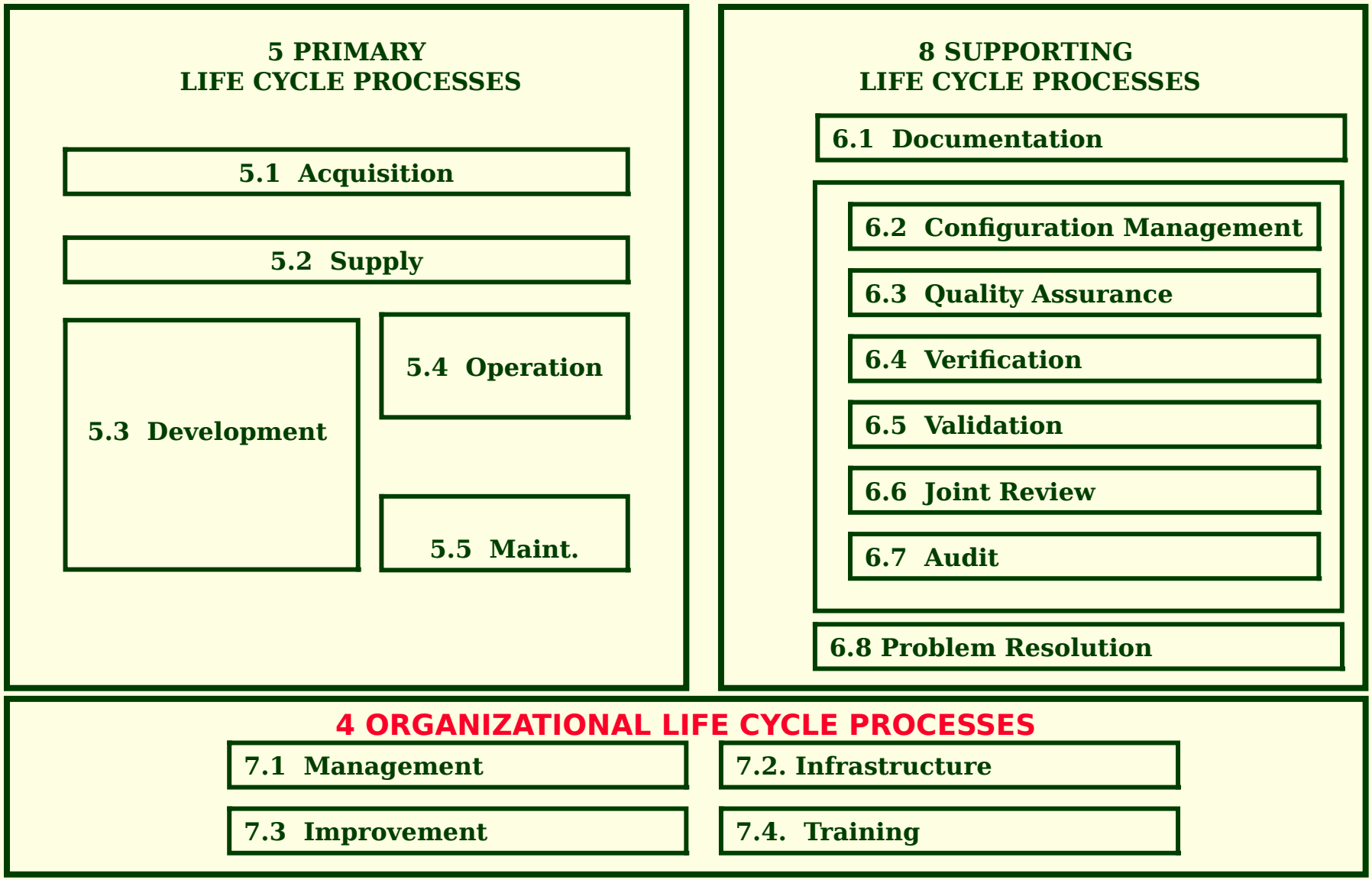

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Four Organizational Processes (pg. 42):

The activities and tasks in an organizational process are the responsibility of the organization using that process. The organization ensures that the process is in existence and functional.

7.1 Management Process
7.2 Infrastructure Process
7.3 Improvement Process
7.4 Training Process

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4.1.1.3 Organizational Life Cycle Processes (pg 8):

1) **Management Process (subclause 7.1) [a process].** Defines the basic activities of the management, including project management, related to the execution of a life cycle process.

2) **Infrastructure Process (subclause 7.2).** Defines the basic activities for establishing the underlying structure of a life cycle process.

3) **Improvement Process (subclause 7.3).** Defines the basic activities that an organization (that is, acquirer, supplier, developer, operator, maintainer, or the manager of another process) performs for establishing, measuring, controlling, and improving its life cycle process.

4) **Training Process (subclause 7.4).** Defines the activities for providing adequately trained

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SUMMARY

IEEE/EIA 12207.0: Software Life Cycle Processes

- **Purpose: This International Standard establishes a *common framework for software life cycle processes*, with well-defined terminology, that can be referenced by the software industry.**
- **Application: Applies to the acquisition of systems and software products and services, to the supply, development, operation, and maintenance of software products, and to the software portion of firmware, whether performed internally or**

IEEE 12207 “Software Life Cycle Processes”

A. Five Primary Processes

1. Acquisition Process
2. Supply Process
3. Development Process
4. Operation Process
5. Maintenance Process

B. Eight Supporting Processes

1. Documentation Process
2. Configuration Management Process
3. Quality Assurance Process
4. Verification Process
5. Validation Process
6. Joint Review Process
7. Audit Process
8. Problem Resolution Process

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C. Four Organizational Processes

1. Management Process
2. Infrastructure Process
3. Improvement Process
4. Training Process

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5 PRIMARY LIFE CYCLE PROCESSES

- 5.1 Acquisition
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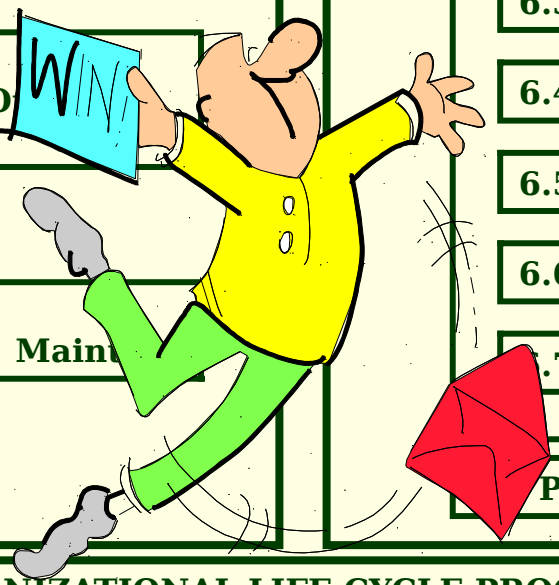

8 SUPPORTING LIFE CYCLE PROCESSES

- 6.1 Documentation
- 6.2 Configuration Management
- 6.3 Quality Assurance
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4 ORGANIZATIONAL LIFE CYCLE PROCESSES

- 7.1 Management
- 7.2. Infrastructure
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